## REMARKS

Claims 1-19 are pending in this application.

Claims 1-19 stand rejected.

Claims 18-19 are amended to correct typographical errors.

No new matter is added.

Claims 1-19 remain in the case.

Applicant requests reconsideration and allowance of the claims in light of the following remarks.

### Claim Rejections - 35 U.S.C. § 103.

Claims 1-7, 10, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pat. No. 5,835,334 issued to McMillin et al ("McMillin") Claims 8, 9, and 11-17 are rejected under 35 U.S.C. 103*a) as being unpatantable over McMillin in view of U.S. Pat. No. 5,645,646 issued to Beinglass et al ("Beinglass") Further, Claim 19 is rejected under McMillin and Beinglass in view of U.S. Pat. No. 6,488,776 issued to Wang ("Wang"). Applicant respectfully traverses the rejections.

Independent claims 1 and 9 both recite that the ceramic plate covering an upper heating surface is not fastened to the heating surface. In this Action, the Examiner simply asserts, without citation to any prior art teaching that it would be obvious *not* to fasten McMillin's ceramic plate to McMillin's ceramic heater to provide servicing of McMillin's ceramic heater. Applicant traverses this rejection on several grounds. First, it is unsupported by any teaching in the prior art. Second, it is contrary to McMillin's teachings and in fact, would be disruptive of operation of McMillin's structure.

In the response to the previous Office Action, the Applicant argued that if the electrode cap 1 and the lower electrode 2 of McMillin. (which the examiner asserted may correspond to the ceramic plate and heater of the present invention) were not fastened to each other, the leakage of coolant gas through the interface therebetween would undesirably increase and thus, it would not have been obvious to a person having ordinary skill in the art not to fasten the electrode cap 1 to the lower electrode 2 in the electrostatic chuck of McMillin et al.

However, the examiner disagreed because for McMillin's cooling gas not to escape, the operating pressure of McMillin's cooling gas flow would only have to be made less (or

equal to) than the prevailing operating pressure of McMillin's chamber within which McMillin's heater device would be housed.

Applicant disagrees. In McMillin, the coolant gas is supplied to the backside of the wafer because the operating pressure of the gas inside the chamber is not enough for the gas to provide adequate thermal communication between the wafer and the electrode cap. If, as the examiner asserted, the coolant gas pressure were made less than or equal to the prevailing operating pressure within the chamber, the coolant gas would become useless in effectively conveying heat between the wafer and the electrode cap, or the pressure at the backside of the wafer would be determined by the prevailing operating pressure within the chamber and the coolant gas would not be able to reach the backside of the wafer, making it impossible to control the wafer backside pressure by varying the pressure of the coolant gas. Thus, in the electrostatic chuck (ESC) of McMillin, the coolant gas pressure should be higher than the prevailing operating pressure within the chamber to be operative, which requires that the electrode cap be fastened to the lower electrode to prevent the coolant gas from escaping through the interface therebetween. Further, in McMillin, the electrode cap and the lower electrode define therebetween channels 6 and 6a to supply a path for a circulating liquid. Therefore, if the electrode cap and the lower electrode were not fastened to each other, the channels would be incomplete, resulting in undesirable leak of the liquid.

For these reasons, there is no motivation or suggestion in McMillin not to fasten McMillin's ceramic plate to McMillin's ceramic heater. See MPEP 2143.02, which states, "If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification."

Further, in this point of view also, it would not have been obvious for persons of ordinary skill in the art not to fasten the electrode cap and the lower electrode in McMillin. It is to be noted that in McMillin, FIG. 2 discloses an electrode cap comprising two pieces, i.e., cap top 1a and cap bottom 1b, and column 6, lines 40-41 recites that the use of a two piece electrode cap facilitates changing damaged ESC surfaces and reduces machining costs. Thus the cap top 1a may better correspond to the ceramic plate of the present invention than the electrode cap 1 does. However, as recited in column 7, lines 4-6, the cap top is mechanically clamped to the cap bottom to create adequate thermal communication between the cap components, which clearly teaches away from the present invention. Further, the coolant gas is introduced to the backside of the wafer via channels 5a formed in the cap top 1a as in the single piece electrode cap 1, and therefore, the above argument regarding the leakage of the

coolant gas through an interface between the electrode cap and the lower electrode is likewise applicable to the coolant gas leakage through an interface between the cap top and cap bottom. Thus, even taking into account the two-piece electrode cap, the claimed invention recited in claims 1 or 9 is patentably distinguishable over the references cited.

For these reasons discussed above, the applicant respectfully requests allowance of claims 1 and 9. Also, claims 2-8 and 10-18 are believed to be allowable for their dependency and their own merits.

As to claim 19, which states that a pressure in the process vessel is controlled in a range of 0.5 torr to 10 torr, the examiner rejected the claim, arguing that it would have been obvious to a person having ordinary skill in the art to optimize McMillin's and Beinglass's chamber processing pressure to be between 0.5 torr and 10 torr by applying the disclosure of Wang of a CVD deposition reactor including low pressure deposition chamber pressures of 0.1 torr to 1 torr.

Applicant disagrees. As described in column 6, lines 21-22, McMillin relates to high density plasma CVD (HDP-CVD) that contains dielectric gap fill deposition of $SiO_2$. As shown in "HDP-CVD: Trying to lasso lightning" (Ed Korozynski, Solid State Technology, April 1996, pp 63-67), a copy of which is attached to this amendment, HDP-CVD is used for sub-0.5μm inter-metal dielectric (IMD) gap-fill (see Figure 1). Such HDP-CVD involves simultaneous deposition and sputter etch processes (Figure 2). To achieve the sputter etch process, it is necessary to ensure a sufficiently large mean-free-path in a range from several millimeters to several centimeters to accelerate ions in the plasma, and this requires quite a low operating pressure on the order of several millitorrs (see page 65, right column). In other words, if the operating pressure were raised to the range of 0.5-10 torr, the mean-free-path would reduce significantly to an order of several micrometers, which would be inadequate for the ions to be accelerated sufficiently to achieve sputter etch. Thus, the applicant believes that a person having ordinary skill in the art would not adopt the operating pressure range of 0.5-10 torr in McMillin.

In HDP-CVD, the impingement of the accelerated ions upon the wafer tends to overheat the wafer. As discussed above, HDP-CVD requires the operating pressure to be about a few millitorrs, and the resulting low-density gas within the chamber results in poor thermal conductivity. Thus, in order to prevent overheating of the wafer in HDP-CVD, it is necessary to close contact the wafer to the surface of the electro static chuck (ESC) with the electrostatic clamping force, as well as to introduce He on the order of several torrs to an interface between the wafer and the ESC surface, to thereby compensate the low thermal

conductivity resulting from the low operating pressure. Further, as argued in the response to the previous Office Action, the low operating pressure necessitates closely fastening the electrode cap 1 and the lower electrode 2 to each other to effectively convey the heat therebetween.

Claim 19 is not intended to be used for HDP-CVD involving sputter etch and specifies the operating pressure range to be 0.5-10 torr. Such a high operating pressure can provide sufficient thermal conduction, which, in contrast to McMillin, makes the additional gas introduction unnecessary and enables the ceramic plate not fastened to the heating surface. Other references cited fail to disclose even a component part which may correspond to the replaceable ceramic plate of the present invention. Thus, the applicant believes that the invention of claim 19 is patentably distinct over the references cited.

## CONCLUSION

For the foregoing reasons, reconsideration and allowance of claims 1-19 of the application as amended is solicited. The Examiner is encouraged to telephone the undersigned at (503) 222-3613 if it appears that an interview would be helpful in advancing the case.

Respectfully submitted,

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I hereby certify that this correspondence is being transmitted to the U.S. Patent and Trademark Office via facsimile number 703-872-9311, on March 19, 2004.

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